

Expert's Opinion – Roman ITM 070106ir

Expert's Name: Professor Yitzhak Roman

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I the signatory below was requested by the lawyer Hagai Siton for a professional opinion with regard to the text on a pomegranate. This opinion is given in connection with case no. 482/04, District Court, Jerusalem. I am providing this opinion in lieu of appearing as a witness in court. And I declare that I know very well, regarding the criminal code related to false testimony in court, the ruling that I have personally signed, is considered as testimony in the court.

Education

1967-1970: Graduate in Physics and Mathematics, Hebrew University, Jerusalem

1970-1972: Certified (with honors) in the science of materials, School of Applied Science, Hebrew University, Jerusalem

1972-1977: Doctor of Engineering (Metallurgy), Univ. California, Los Angeles

Professional Credits and Competence

1. Professional Engineer, California (Quality Engineering), Registration No. QU 2809 (1978)
2. Book of Engineers and Architects, State of Israel (Material Engineering), Registration No. 39165 (1988)
3. Investigator of aircraft accidents and Officer of Flight Safety, Israel Air Force, (1989)

Occupational Experience

1970-1972: Testing Engineer (Non-Destructive) for companies: Ultrasonics and Moreks 71, Tel Aviv

1972-1977: Senior Investigator for Failure Analysis Associates, Los Angeles, California

1978-Today: Lecturer and Investigator (today staff professor) Faculty of Natural Sciences, The Hebrew University, Jerusalem

1984-1994: Instructor and investigator of aircraft failures and accidents, Major (reserves) Israel Air Force

1990-1992: Senior Guest Scientist in materials laboratory, United States Air Force, Wright-Patterson Air Base

1972-Today: Consultancy and expert opinion to public institutions like: Courts. IDF, Israel Police-Forensic Lab., Civil Aviation Authority, Military Industry, and private organizations: industrial companies, insurance, appraisers and lawyers.

Relevant Experience

- 35 years experience investigating systems and components failings and symptoms
- Research, pedagogue and teaching research students various subjects in the science and engineering of materials.
- Analysis of signs and their significance, observed by me or by other investigators of exhibits made from various materials.
- Academic director of the SEM unit (Electronic Microscope Scanner) of the Hebrew University in Jerusalem during the 1990s.
- Research and various examinations of archaeological finds (such as from the City of David, ancient copper, coins from the Dead Sea) and the study of patinas on statuettes.

The following is my opinion:

1. Background (as presented by the lawyer Siton)

- 1.1. In the introduction to the amended indictment it was claimed (section 2 τ) that the "inscribed ivory pomegranate ascribed to be the sole remnant of the First Temple period" is a forgery.
- 1.2. Another claim is that the pomegranate is one of many archaeological items said to be ancient. An additional claim is "the method of forgery was characterized, in most instances, by using ancient artifacts onto which inscriptions or ornaments were inscribed, which turned them into very valuable items."
- 1.3. This claim is based on the conclusions of a committee of experts nominated in September, 2004 (by the Israel Museum and the Israel Antiquities Authority) to determine the authenticity of the pomegranate. The team, that included Prof. Goren claimed, inter alia, the inscription on the pomegranate was added recently. In addition this conclusion is reached because sections of the letters of the inscription that are near the break in the pomegranate do not cross the break line, and the patina found within the letters was adhered to them.

2. Requested Opinion

- 2.1. To examine the pomegranate and relate to the points of view stated above in the report of the experts committee.

3. My opinion is based on:

- 3.1 Visual stereoscopic examination, and by use of electrons microscope, of the pomegranate.
- 3.2 Report by the committee of experts, above

4. Findings:

- 4.1 On October 2, 2008 I first examined the pomegranate for approximately 2 hours. The following are my findings:
- 4.2 The pomegranate in question is small (maximum diam. about 2 cm, and height around 4 cm.) with a bore (diameter of about 7 mm.) that is shallow (15 mm. length of the long axis, from the base). From the elliptical body of the pomegranate to the six pointed petals of the crown that is above, the neck, on which is engraved the inscription. A significant part of the body of the pomegranate is broken on the surface parallel to the long axis of the pomegranate, in addition secondary breaks on the petals of the crown.

The vertical break passes through part of the inscription so that only nine letters appear complete, and three additional letters are fragmentary, and if there were additional letters, they are not be visible at all.

- 4.3 On perusing the surface of the fracture, two areas can be seen that have lighter

shades than the major portion of the surface. It would seem that these two areas (which were marked by the committee as NLB and NRB) are relatively new to the major fracture.

4.4 From the visual analysis of the fragmentary letters in the area of the fracture on the neck, using the electron microscope scanner, I detected the following:

- a. The fracture line begins at the continuation of the letters *lamed* and *bet*, and in this area the fracture marked as NRB also appears. Here, a small horizontal line can be detected that relates to “the tail” on the lower part of the letter *yod*. This line is cut by the fracture line of NRB, and does not stop before it, as claimed by the committee.
- b. In continuation, two strokes attributed as traces of the letter *taw* are visible. The right hand stroke is severed by the fracture line of NRB, while the left one is severed by the fracture line of the main fracture (the old one). Both strokes are severed by the fracture lines, and do not stop before this as indicated by the committee.
- c. I found no evidence that there are missing letters, and it is not clear to me (from the signs point of view), on what basis it was suggested that the missing letters were: *yod*, *he* and *waw*.
- d. In continuation, the fracture line met the NLB and at its extremity appear a tiny remnant that the committee do not refer to; it appears in a place where the stroke of letter *waw* finishes and it is possible that it is the ending of the left upper stroke of this letter. This remnant also cuts across the fracture line.
- e. In due course, we find remnants of the letter that was identified as *he*. If these are the remnants of the letter *he*, what remains is the upper part of the letter - a horizontal line and the beginning of the vertical line of the letter. The vertical line of the remnant, is cut by the fracture line of the main fracture (the old one), and does not stop before it.

4.5 From the examination of the complete letters, using the electron microscope scanner, I detected the following:

- a. The letters are incised into the material and in a large part of them, with a moderate passage from the depth of the letter to the edges of the material.
- b. There is foreign matter in the letters.
- c. Upon examination of the makeup of the foreign matter using EDX system the following elements were mostly found: carbon, oxygen, silicone, and calcium, as also small amounts of aluminum, phosphorous, magnesium, potassium and traces of iron, chlorine and sulphur. Excluding the makeup of the pomegranate material, hippopotamus ivory, (made of calcium hydrocsile phosphate + organic material such as Colagen), it would seem that the foreign material is a mineral patina with the addition of organic material.
- d. From the viewpoint of this foreign material, I did not find morphological findings that indicate that it was applied (glued).

5 Conclusion:

- 5.1 From the results of my investigation, I am of the opinion that the fracture lines on the pomegranate cut across the remnants of the letters as detailed above and a space does not exist between the remnants and the fracture lines.
- 5.2 Therefore, the letters, of which remnants remained on the surface of the pomegranate existed at the time when the fractures were created.
- 5.3 I found no indication that could support the suggestion that the patina inside the letters was glued.

December 10, 2008
Professor Yitzhak Roman

CAPTIONS

Photo 1:

General view of the pomegranate: axis well, old fracture surface, two new fracture surfaces (lighter) and the petal crown of which two are broken.

Surface of "old" fracture, well axis, NLB, NRB, 4 cm

Photo 2 (page 5):

View of the second side of the pomegranate.

4 cm

Photo 2 (page 6):

View of the lip of the fracture close to NRB (photo via SEM, secondary electrons, SE).

Strokes of the *taw*, surface of "old" fracture, NRB

Photo 3:

View of the lip of the fracture close to NLB (photo via SEM, secondary electrons, SE)

Fragment of *waw* ?, fragment of *he*, surface of "old" fracture, NLB

Photo 4:

View of the letters *khnm* (photo via SEM, secondary electrons, SE)

Photo 5:

Close up view of the letter *he* (photo via SEM, secondary electrons, SE)

Caption for diagrams:

Spectrum composition, EDX, characteristic of the patina in the letter *he*.

Spectrum composition EDX, characteristic of the material of the pomegranate adjoining the letter *he*.